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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/524,951

12/08/2005

Lloyd Christopher Hollenberg

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WOOD, PHILLIPS, KATZ, CLARK & MORTIMER

500 W. MADISON STREET

SUITE 3800

CHICAGO, IL 60661

EXAMINER

KIM, JAY C

ART UNIT

PAPER NUMBER

2815

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/524,951	<b>Applicant(s)</b> HOLLENBERG ET AL.	
	<b>Examiner</b> JAY C. KIM	<b>Art Unit</b> 2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 15 June 2009.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-27 is/are pending in the application.
- 4a) Of the above claim(s) 20-27 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1 and 9-16 is/are rejected.
- 7) ☒ Claim(s) 2-8 and 17-19 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 February 2005 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

### DETAILED ACTION

This Office Action is in response to Amendment filed June 15, 2009.

#### ***Drawings***

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the “surface charge detection devices repeated (emphasis added)” recited in claim 17 must be shown in Fig. 1(a) of current Application or the feature canceled from the claim, because Fig. 1(a) of current Application shows *only one surface charge detection device* that may be repeated. No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as “amended.” If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either “Replacement Sheet” or “New Sheet” pursuant to 37 CFR 1.121(d). If the changes are not accepted by the

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examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Claim Objections***

2. Claims 1, 2, 11-13, 17 and 18 are objected to because of the following informalities:

In claim 1, "substrate" should be inserted after "inert solid" on line 2 to avoid indefiniteness of claim 2, "the location" should be replaced by "a location" and "the logical" should be replaced by "a logical" on line 7, and "and," should be replaced by "and" on line 10.

On line 3 of claim 2, "the" should be inserted before "two potential wells".

On line 2 of claim 11, "the surface" should be replaced by "a surface", and "donor atoms" should be replaced by "dopant atoms".

On line 3 of claim 12, "known as the" should be replaced by "a", because one of ordinary skill in the art may use a different terminology other than "'barrier" gate or B-gate", and the terminology may vary over time and thus may not be "known as the 'barrier' gate or B-gate" in the future.

On line 3 of claim 13, "known as the" should be replaced by "a" for the same reasons stated above, and ">" and "=" should be removed.

On line 2 of claim 17, "comprising two dopant atoms, surface gates and surface charge detection devices repeated" should be replaced by "wherein a configuration comprising two dopant atoms, surface gates and surface charge detection devices is repeated".

On line 2 of claim 18, “donors” should be replaced by “dopant atoms” and “the” before “charge qubits” should be removed.

***Claim Rejections - 35 USC § 112***

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 9-16 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 9, it is not clear what “the donor electrons” refer to, because the charge qubit is a P-P<sup>+</sup> system, which would have only one electron. Claim 10 depends on claim 9, and therefore claim 10 is also indefinite.

Regarding claim 11, it is not clear whether “gate electrodes” on line 1 include “a first gate” and “at least one second gate” or are additional gate electrodes, which may be a new matter. Claims 12-16 depend on claim 11, and therefore claims 12-16 are also indefinite.

***Claim Rejections - 35 USC § 102***

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

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6. Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Kane (US 6,369,404).

Regarding claim 1, Kane discloses a quantum device (Fig. 3) comprising an electrically inert solid substrate (5) (col. 7, line 11) within which there is a charge qubit comprising a pair of dopant atoms (two  $^{31}\text{P}$ ) having a net charge (electrons) and *inherently* an electric field having two potential wells, wherein the two potential wells are *inherently* located adjacent respective dopant atoms (two  $^{31}\text{P}$ ), and wherein a first gate (8) (col. 7, line 14) is located over a potential barrier, which is *inherently* formed, between the two potential wells, and at least one second gate (7) (col. 7, line 13) is located.

Further regarding claim 1, the claim limitations “the location of the net charge in the electric field having two potential wells defines the logical state of the qubit”, “to control barrier height”, and “to control relative shapes and sizes of the two potential wells” specify an intended use or field of use, and are treated as non-limiting since it has been held that in device claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. *In re Casey*, 152 USPQ 235 (CCPA 1967); *In re Otto*, 136 USPQ 458, 459 (CCPA 1963). A claim containing a “recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus” if the prior art apparatus

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teaches all the structural limitations of the claim. *Ex Parte Masham*, 2 USPQ 2d 1647 (Bd. Pat. App. & Inter. 1987).

### ***Allowable Subject Matter***

7. Claims 2-8 and 17-19 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims and if amended to overcome claim objections stated above.

### ***Response to Arguments***

8. Applicants' arguments filed June 15, 2009 have been fully considered but they are not persuasive.

Applicants argue that “particularly, Kane does not disclose or suggest a charge qubit”, that “Kane does not envisage the possibility that a qubit could be defined in a two dopant atom system using net charge”, that “moreover, Kane does not envisage the logical state of such a qubit being defined by the location of the net charge in the double-wall potential field created by such a system”, that “further, Kane does not disclose a qubit capable of being made with a fabrication position of more than 200 Å”, and that “Kane does not disclose any novel qubit architecture”. As stated above, the claim limitations “the location of the net charge in the electric field having two potential wells defines the logical state of the qubit”, “to control barrier height”, and “to control relative shapes and sizes of the two potential wells” specify an intended use or field of use, and are treated as non-limiting since it has been held that in device claims, intended use must result in a structural difference between the claimed invention and

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the prior art in order to patentably distinguish the claimed invention from the prior art. In other words, the quantum device disclosed by Kane is capable of performing the claimed intended use even though Kane does not specifically disclose a charge qubit, especially because Applicants do not specifically claim where the recited “net charge” comes from, and how and what type of a charge qubit is formed in claim 1. Also, it is improper to import claim limitations from the specification. See MPEP 2111.01.

However, Kane does not disclose a “P-P<sup>+</sup> system” recited in claim 2. Further, claim 1 does not recite spacing between P atoms.

Applicants argue that “in contrast, the present invention, as defined by claim 1, is not concerned with read out or with spin qubits”, that “by this Amendment, the elements of the claims considered by the Examiner to specify intended use or field of use have been eliminated or recast to define structural differences between the claimed invention and Kane”, that “as is apparent, claim 1 is not anticipated by Kane, as Kane does not disclose each and every element of claim 1, arranged as in the claim”, that “moreover, Kane does not suggest the invention defined by claim 1”, and that “a significant advantage of the current invention is that it defines a charge qubit that can be fabricated with up to 200 nm precision and still function, an improvement of ten fold over the qubit of Kane”. Amended claim 1 does not recite spacing between P atoms. Further, see the above responses.

### ***Conclusion***

9. Applicants' amendment necessitated the new grounds of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP



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§ 706.07(a). Applicants are reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JAY C. KIM whose telephone number is (571) 270-1620. The examiner can normally be reached on 7:30 AM - 5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Parker can be reached on (571) 272-2298. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J. K./  
Examiner, Art Unit 2815  
October 6, 2009

/Jerome Jackson Jr./  
Primary Examiner, Art Unit 2815